

## **Chapter 2: Alternatives**

This chapter presents and describes the alternatives considered for meeting the purpose of and need for the Southern Corridor. Section 2.1, Summary of the Alternative Development Process, presents ways to meet the need for the project. The remainder of the chapter discusses reasonable alternatives for the Southern Corridor and summarizes the detailed evaluations of these alternatives.

### **2.1 Summary of the Alternative Development Process**

Under the alternative development process, both non-highway and highway build alternatives were reviewed, as described below. The options were evaluated to determine whether they met the purpose and need of the project and were evaluated according to other criteria including operational features, cost, constructibility, safety, capacity, geography, demographics, and environmental characteristics.

#### **2.1.1 Non-highway Alternatives**

##### **2.1.1.1 Arterial Roads**

A review of the existing road network, future land use plans, preferences of the local community, and physical constraints was conducted to determine whether improving the existing arterial system could meet the project's purpose and need. As noted in Section 1.2, Existing Transportation System Linkage, the existing arterial system consists of discontinuous roadways that serve short local trips rather than long through trips (see Figure 1-2, Regional and Local Roadways).

The review determined that an improved arterial system would not meet the project's purpose and need based on the following reasons:

- An improved arterial system would not meet the primary purpose of providing a single regional transportation facility between St. George, Washington City, and Hurricane. The expanded arterial system would also not be compatible with the local cities' and the county's land use plans for a regional transportation facility, or with the preferences of the local communities (see Section 1.1.3.2, Local Planning Studies and General Plans).
- The existing system of arterial streets cannot be extended to accommodate additional demand because of geographic constraints such as the Virgin River and topographic limitations such as White Dome, Washington Dome, and Middleton Black Ridge (see Figure 1-3, Natural Constraints). Future roads would be aligned around these natural features, creating narrow corridors that would increase traffic congestion.

Because of topographic limitations, the arterial system would have limited access points to I-15, St. George, and Washington City, restricting arterial roads in this area to the current roadway network operating near capacity.

- There are limited opportunities to widen existing arterials immediately south and east of I-15 because of the amount of and proximity to adjacent development.
- An arterial system with intersections and numerous access points would not function as a regional through facility and would increase delays and air emissions by reducing travel speed.

In summary, an arterial system could be developed to provide access to planned development, but such a system could not function as an alternate regional facility between St. George, Washington City, and Hurricane. In addition, an arterial system would not reduce traffic congestion in the area south and east of I-15, where development is planned. However, as part of the No-Build Alternative, an arterial system has been developed.

#### **2.1.1.2 Transportation Management Strategies**

Transportation management strategies (TMS) increase the person-capacity of a transportation system without adding pavement or travel lanes, and include alternative options such as fringe parking, ride sharing, and high-occupancy vehicle lanes on existing roadways. St. George has been working and will continue to work with UDOT to implement TMS to improve the signal system, reducing driver delays at intersections. TMS will be an integral part of the

MPO's future transportation planning. TMS are included with all of the alternatives.

TMS alone cannot address the primary purpose and need for a proposed regional facility. TMS will ease traffic on I-15 and SR 9 and other major arterial roads, but they cannot meet the demand or substantially improve mobility in the area, which is hampered by the physical layout of the roadways. As described in Chapter 1, Purpose of and Need for Action, the roadway network south and east of I-15 is characterized by disjointed two-lane roadways, which results in congestion and operating inefficiencies. Because TMS are not designed to address this type of problem, they cannot offer a complete solution.

### 2.1.1.3 Mass Transit

Mass transit includes reasonable and feasible transit options such as bus service and rail systems. A key component of transit usage is the density of development required to make transit use practical. An analysis of data regarding transit use in relationship to housing density was conducted using six metropolitan areas ranging in population from 531,000 to 16,300,000 (Pushkarev and Zupan 1977). This study was used to determine the viability of mass transit in the Southern Corridor project area.

The study concluded that housing densities of 2 to 7 dwellings per acre produced only marginal use of public transportation. Densities of 7 to 30 dwellings per acre were necessary to sustain transit use in the range of 5 to 40%.

This study also determined what transit modes would work best based on the dwelling unit densities. The study concluded that local bus service would work with densities of 4 to 7 dwellings per acre, but rail service would require a minimum of 9 dwellings per acre. The rail service would further require a downtown area of 35 to 50 million square feet in a metropolitan area of more than 750,000 people with a large workday peak trip to the downtown area.

**Bus Systems.** The project area has an operating bus service system. The Dixie Area Rapid Transit System is the only mass transit currently in the area. The service in 2003 was limited to three routes with no express routes. As the population in the area grows, bus service will expand to meet increased transit demand.

However, bus service with an expanded arterial road network will not meet the demand for future developed areas and would not meet the main purpose of providing a regional transportation facility between St. George, Washington City, and Hurricane. Additional planning for transit service, including identifying a funding source and a permanent operating agency, will be conducted by the MPO.

**Rail Transit.** Although rail transit could provide access to planned development, the expected population density of the area could not support a rail transit system. As noted earlier in this section, high-capacity rail transit, including light rail, is generally not feasible until residential densities reach at least 9 dwellings per acre. A density of about 9 dwellings per acre is typically considered the lowest threshold necessary to provide enough riders to make a rail transit investment financially feasible.

The Washington County Water Conservancy District (WCWCD) prepared the *Population Management Study for Washington County, Utah* (WCWCD 1994). This study identified unconstrained, undeveloped areas in Washington County that are available for future development. The study also projected future populations based on three growth scenarios using the 1990 U.S. census as a baseline.

One scenario used high levels of growth and dense land use patterns for the undeveloped areas surrounding existing municipalities. Using this scenario, the area does not have the residential density of 9 dwellings per acre required to make rail transit feasible. The average for high-density, multiple-family residential zones was estimated at 18.2 persons per acre. This number was divided by an average household size of 2.61 people per dwelling to obtain a residential density of 7 dwellings per acre. Additionally, the high-density residential zone in this scenario was assumed to cover over one-third of the total undeveloped land.

This number is close to 9 dwellings per acre, the threshold necessary to investigate rail transit feasibility. However, the WCWCD study may have overestimated future populations. As an example, this scenario's results projected St. George's population in 2020 as 165,303 people. In comparison, the City of St. George believes that a population of 147,990 by 2030 is more reasonable based on the 2000 U.S. census. For more information, see Section 1.5.1, Population Growth. Although some of the dwelling units per acre in the St. George area may by 2030 be close to those in Salt Lake City where a light rail system is currently operating, the St. George area will not have the overall population size or centralized business district of Salt Lake City.

The likelihood of implementing a rail transit system in the project area is further reduced by the lack of a centralized business district with the required square footage noted above and the required population base of 750,000 to commute to the downtown area. The reasons for the decentralized population in the project area are the high percentage of retirees compared to other cities and the area's service-oriented economy. Both the future St. George Long-Range Plan and the proposed planning studies for the undeveloped areas in southern St. George show

a more decentralized business district that would promote more bus use versus rail transit.

Although the current area operates only limited bus service, measures can be taken to improve the use of transit. Chapter 6, Smart Growth, reviews measures that can be taken to implement an effective transit system.

#### **2.1.1.4 Conclusion**

The review of arterial roads and mass transit showed that neither of these options meets the need of the project, either individually or combined. Therefore, they have been eliminated from detailed study.

### **2.1.2 Highway Alternatives**

To determine whether an alternative would meet the project's purpose and need, traffic modeling was conducted as noted in Chapter 1, Purpose of and Need for Action. To meet the project's purpose and need, an alternative must provide a regional transportation facility between St. George, Washington City, and Hurricane, reduce some traffic on the existing and future network of arterial and city streets, improve traffic conditions in areas already developed, and accommodate areas of planned future growth. The alternative must be compatible with local and regional transportation and land use plans.

#### **2.1.2.1 Planned Growth Areas**

As discussed in Chapter 1, growth in the region is expected to continue through the 2030 planning period. Discussions with planning and resource agencies have indicated that growth will occur to the south and east of I-15, since the area north of I-15 has been developed within the limits of the topography and the 61,022-acre Red Cliffs Desert Reserve.

The Red Cliffs Desert Reserve was established to protect the desert tortoise and other sensitive animal and plant species (see Figure 2-1, Red Cliffs Desert Reserve). The reserve, which was established as part of a Habitat Conservation Plan, focuses its management practices on protecting species from direct and indirect impacts from a variety of human activities. By protecting species and their habitats, Washington County is able to proceed with orderly growth and development. In addition, the Red Cliffs Desert Reserve helps to maintain "quality of life" values for local communities that include the preservation of open space and the protection of natural views, municipal watersheds, night sky, and natural quiet. The reserve also provides outstanding opportunities for non-motorized recreation (hiking and equestrian uses) close to local communities.

A network of arterial roads to accommodate access to planned growth has not been sufficiently developed south and east of I-15. The anticipated growth in this area is indicated by the submission of plans to the local cities' planning agencies for the South Block, Outlaw Ridge, Dixie Springs, Red Hawk, and Leucadia developments (see Figure 1-4, Future Developments). Additionally, several industrial developments are currently planned south of I-15. As these developments are implemented, access will need to be provided and the existing system of arterial roads expanded to meet the expected growth. However, these roads cannot be expanded sufficiently to meet future intraregional demand (see Section 2.1.1, Non-highway Alternatives).

Table 2.1-1 below shows the modeling results for the 2030 planning period including the Southern Corridor. Results of the modeling demonstrate that a new highway would reduce some traffic on the network of arterial and local streets; this network would otherwise be operating at or over capacity. The modeling results were based on a total regional population of 208,641 as shown in Table 1.5-1, 1994–2030 Population and Dwelling Unit Growth Rates. For an explanation of LOS, see Section 1.3.1, Level of Service.

The 2030 modeling results from the QRSII model show that many roads would operate over capacity. This occurs because QRSII assigns traffic to the shortest route until capacity is reached, then assigns traffic to the next available route, which results in both routes' operating above capacity. QRSII continues to assign traffic to the roadways in the network in this manner, regardless of their being over capacity, to satisfy the trip generation and destinations defined by the socioeconomic inputs for the model. It is expected that, as traffic increases in the area, the local governments would implement roadway improvements to minimize congestion.

Table 2.1-1. 2030 LOS, No-Build and Build Alternatives

Segment	Number of Lanes	Capacity for LOS E (ADT)	No-Build		3400 West (Alternative A)			2800 West (Alternative D)			4300 West (Alternative E)			
			Volume (ADT)	LOS	Volume (ADT)	LOS	Volume Compared to No-Build	Volume (ADT)	LOS	Volume Compared to No-Build	Volume (ADT)	LOS	Volume Compared to No-Build	
SR 9 Segments														
SR 9 at 4400 W. (west leg)	5	39,000	59,398	F	50,435	F	Decreased	49,392	F	Decreased	52,041	F	Decreased	
SR 9 at 1760 W. (east leg)	5	39,000	35,533	E	42,527	F	Increased	39,823	F	Increased	41,778	F	Increased	
Brigham Road Segments														
Brigham Rd. (I-15 to Frontage Rd.)	3	16,500	26,020	F	24,833	F	Decreased	26,843	F	Increased	24,903	F	Decreased	
Brigham Rd. at Node 45 (interchange between Frontage Rd. and River Rd., west leg)	3	16,500	40,621	F	22,674	F	Decreased	24,791	F	Decreased	22,518	F	Decreased	
Brigham Rd. at River Rd. (west leg)	3	16,500	23,529	F	14,321	E	Decreased	19,906	F	Decreased	14,132	E	Decreased	
I-15 Segments (Existing Cross-Section)														
I-15 NB (Atkinville to Brigham)	2	44,500	19,369	A-C	39,142	E	Increased	40,038	E	Increased	38,974	E	Increased	
I-15 SB (Atkinville to Brigham)	2	44,500	19,369	A-C	36,702	E	Increased	35,716	E	Increased	36,446	E	Increased	
I-15 NB (Brigham to Bluff)	2	44,500	36,880	E	48,332	F	Increased	49,249	F	Increased	48,083	F	Increased	
I-15 SB (Brigham to Bluff)	2	44,500	34,052	D	50,260	F	Increased	50,573	F	Increased	49,851	F	Increased	
I-15 NB (Bluff to St. George)	2	44,500	36,428	E	41,539	E	Increased	42,610	E	Increased	41,398	E	Increased	
I-15 SB (Bluff to St. George)	2	44,500	36,316	E	41,565	E	Increased	42,038	E	Increased	41,347	E	Increased	
I-15 NB (St. George to Green Springs)	2	44,500	43,394	E	42,603	E	Decreased	42,954	E	Decreased	42,546	E	Decreased	
I-15 SB (St. George to Green Springs)	2	44,500	49,876	F	47,165	F	Decreased	46,984	F	Decreased	47,128	F	Decreased	
I-15 NB (Green Springs to RP 13)	2	44,500	43,987	E	41,702	E	Decreased	41,593	E	Decreased	41,507	E	Decreased	
I-15 SB (Green Springs to RP 13)	2	44,500	45,585	F	40,204	E	Decreased	39,755	E	Decreased	40,042	E	Decreased	
I-15 NB (RP 13 to SR 9)	2	44,500	44,018	E	40,778	E	Decreased	41,262	E	Decreased	40,502	E	Decreased	
I-15 SB (RP 13 to SR 9)	2	44,500	42,706	E	39,694	E	Decreased	39,263	E	Decreased	39,527	E	Decreased	

Segment	Number of Lanes	Capacity for LOS E (ADT)	No-Build		3400 West (Alternative A)			2800 West (Alternative D)			4300 West (Alternative E)			
			Volume (ADT)	LOS	Volume (ADT)	LOS	Volume Compared to No-Build	Volume (ADT)	LOS	Volume Compared to No-Build	Volume (ADT)	LOS	Volume Compared to No-Build	
River Road Segments														
River Rd. at Brigham Rd. (north leg)	3	15,000	30,131	F	24,630	F	Decreased	20,879	F	Decreased	19,154	F	Decreased	
River Rd. at Brigham Rd. (south leg)	3	15,000	46,012	F	24,630	F	Decreased	29,048	F	Decreased	24,501	F	Decreased	
River Rd. at 2450 S. (north leg)	3	15,000	27,602	F	22,340	F	Decreased	22,405	F	Decreased	22,381	F	Decreased	
River Rd. at Riverside (south leg)	5	39,000	61,351	F	60,564	F	Decreased	61,318	F	Decreased	60,334	F	Decreased	
River Rd. at 100 S. (south leg)	5	39,000	27,869	D	27,502	D	Decreased	28,530	E	Increased	27,452	D	Decreased	
2450 South Segments														
2450 S. at River Rd. (east leg)	3	15,000	22,556	F	17,634	F	Decreased	17,463	F	Decreased	17,602	F	Decreased	
2450 S. at Little Valley (west leg)	3	15,000	20,236	F	10,644	D	Decreased	10,208	D	Decreased	10,669	D	Decreased	
Miscellaneous Segments														
Industrial Rd. (Washington Fields to Telegraph Rd.)	3	15,000	9,052	D	5,152	A-C	Decreased	5,292	A-C	Decreased	4,829	A-C	Decreased	
RP 13 connector (Telegraph Rd. to I-15)	5	39,000	9,964	A-C	6,293	A-C	Decreased	6,488	A-C	Decreased	6,258	A-C	Decreased	
Telegraph Rd. at Main St. (west leg)	5	39,000	14,533	A-C	13,795	A-C	Decreased	13,526	A-C	Decreased	13,710	A-C	Decreased	
Little Valley at 2450 South (south leg)	3	15,000	18,933	F	5,316	A-C	Decreased	5,665	A-C	Decreased	5,302	A-C	Decreased	
3000 East at 1450 South (south leg)	3	15,000	17,342	F	9,903	A-C	Decreased	10,007	D	Decreased	9,971	A-C	Decreased	
2450 East (Riverside to 2000 S.)	3	15,000	20,570	F	16,861	F	Decreased	17,320	F	Decreased	16,648	F	Decreased	
Washington Dam at Washington Fields (east leg)	3	15,000	12,208	E	5,945	A-C	Decreased	5,500	A-C	Decreased	5,636	A-C	Decreased	
Pineview at Industrial Rd. (north leg)	3	15,000	10,314	D	7,782	A-C	Decreased	8,154	A-C	Decreased	7,529	A-C	Decreased	
Washington Fields at Industrial Rd. (south leg)	5	39,000	14,679	A-C	10,323	A-C	Decreased	10,051	A-C	Decreased	9,680	A-C	Decreased	

Segment	Number of Lanes	Capacity for LOS E (ADT)	No-Build		3400 West (Alternative A)				2800 West (Alternative D)				4300 West (Alternative E)			
			Volume (ADT)	LOS	Volume (ADT)	LOS	Volume Compared to No-Build		Volume (ADT)	LOS	Volume Compared to No-Build		Volume (ADT)	LOS	Volume Compared to No-Build	
Southern Corridor Segments																
All Build Alternatives																
South Belt, I-15 to 1st interchange	4	89,000			60,713	D			59,278	C			60,268	D		
South Belt, 1st interchange to River Rd.	4	89,000			32,020	A-C			28,618	A-C			31,873	A-C		
South Belt, River Rd. to Fort Pearce	4	89,000			29,236	A-C			24,165	A-C			29,211	A-C		
South Belt, Fort Pearce to Airport #1	4	89,000			28,481	A-C			25,510	A-C			28,622	A-C		
South Belt, Airport #1 to Airport #2	4	89,000			18,071	A-C			15,642	A-C			18,276	A-C		
South Belt, Airport #2 to Red Hawk	4	89,000			20,678	A-C			18,122	A-C			20,930	A-C		
South Belt, Red Hawk to Washington Dam	4	89,000			29,443	A-C			23,893	A-C			29,411	A-C		
South Belt, Washington Dam to 5400 W.	4	89,000			31,225	A-C			25,099	A-C			30,993	A-C		
3400 West Alternative (A)																
South Belt, 5400 W. to 4000 W.	4	89,000			28,481	A-C										
South Belt, 4000 W. to 2000 S.	4	89,000			27,917	A-C										
South Belt, 2000 S. to SR 9	4	89,000			39,403	A-C										
2800 West Alternative (D)																
South Belt, 5400 W. to 3000 S.	4	89,000							20,015	A-C						
South Belt, 3000 S. to SR 9	4	89,000							19,293	A-C						
4300 West Alternative (E)																
5400 W. to 2000 S.	4	89,000											30,470	A-C		
2000 S. to SR 9	4	89,000											31,445	A-C		

With the addition of the Southern Corridor, the output from the travel demand model indicates some traffic volume decrease on the local arterial and collector roadways, improving access to and increasing traffic on I-15. This increase in traffic on I-15 is due to traffic using the I-15 Atkinville interchange via the Southern Corridor instead of the Bloomington interchange via River and Brigham Roads. In other words, the freeway system would absorb regional trips that would otherwise occur, at least in part, on the local arterial system. In addition, traffic on SR 9 would increase at the connection point with the Southern Corridor. The increase in traffic may require expansion of I-15 from Brigham Road to Bluff Street to six lanes and SR 9 at some locations to seven lanes.

Several facilities would have improved volume-to-capacity ratios with the addition of the Southern Corridor, although planned improvements for these facilities may not be sufficient. The analysis shows that while operations would improve, some arterial roadways would remain at LOS E or F with the addition of the Southern Corridor. Although the Southern Corridor does reduce some congestion, its primary purpose is to provide a regional transportation facility between St. George, Washington City, and Hurricane, with a secondary purpose of reducing congestion on some existing arterial roads.

Interviews with local planning officials indicated that the transportation improvement plans generally have a planning year of 2020, while the planning horizon for this study is 2030. The officials noted that all anticipated projects identified to occur between 2020 and 2030 are already in the 2020 long-range plan. The results of this modeling effort may help update those long-range plans.

Based on the model outcome for the 2030 No-Build and build alternatives, operations at the following locations are anticipated to improve (see Figure 2-2):

- I-15 Bloomington interchange (RP 4)
- Brigham Road and River Road intersection
- Brigham Road between I-15 and River Road
- River Road from the current south terminus to 100 South
- River Road and 1450 South intersection
- River Road and Riverside Drive intersection
- Little Valley Road south of 2450 South
- 2450 South from River Road to 3000 East
- 2450 East south of Riverside Drive
- Pineview from Telegraph Road to Industrial Road
- SR 9 from 4400 West to I-15
- Industrial Road from Washington Fields Road to Telegraph Road
- Washington Fields Road south of Industrial Road
- Washington Dam Road east of Washington Fields Road

The 2030 ADT on the Southern Corridor varies according to the build alternative and the location along the corridor. The Southern Corridor would help alleviate some congestion in many areas of the region by diverting traffic from limited local arterial roads such as River Road, Brigham Road, Little Valley Road, Fort Pearce Road, and Riverside Drive.

### 2.1.2.2 Travel Time and Cost

Using the future traffic volumes predicted by the QRSII model, a comparison of the No-Build and build alternatives was made to determine the cost savings, if any, to travelers if the Southern Corridor is built. QRSII supplies vehicle-hours traveled (VHT) in the network on the average weekday. Comparing the network VHT for each build alternative versus the No-Build Alternative gives an indication of the relative time savings associated with each alternative. Land use planning that has occurred in the project area and incorporates mixed-use development was included in the analysis for all alternatives. The mixed-use land use projections result in reduced trips and/or trip lengths since many goods and services are located next to residential areas.

Road user unit costs vary by location and vehicle type. Passenger cars typically have the lowest hourly cost, with single-unit trucks and semitrailer trucks being slightly higher. Unit costs by category range from \$9 to \$12 per hour for passenger cars, \$15 to \$20 per hour for light trucks, and \$25 to \$30 per hour for heavy trucks (Texas Transportation Institute 1999). These costs were obtained through surveys of several states, not including Utah. Hourly road user costs in Utah have not been studied.

For this planning-level analysis, an average road user cost per vehicle of \$10 per hour was used for all classes of vehicles, which resulted in a conservative estimate of the road user cost impacts for the Southern Corridor. These results, summarized in Table 2.1-2, show that travel costs under the build alternatives would be reduced compared to the No-Build Alternative.

**Table 2.1-2. 2030 User Cost Summary by Alternative**

Alternative	Weekday Daily VHT (Entire Network)	Weekday Daily Hours less than No-Build	Weekday Daily Road User Cost (Entire Network)	Weekday Daily Cost Savings over No-Build <sup>a</sup>	Annual Cost Savings over No-Build <sup>b</sup>
No-Build	214,455	—	\$2,144,550	—	—
3400 West	198,217	16,238	\$1,982,170	\$162,380	\$50,378,395
2800 West	196,763	17,692	\$1,967,630	\$176,920	\$54,889,430
4300 West	198,810	15,645	\$1,988,100	\$156,450	\$48,538,613

Cost comparison is for comparative purposes only. Cost is savings expected from total road users based on reduced travel time.

<sup>a</sup> Assumes an average vehicle cost per hour of \$10.

<sup>b</sup> Assumes that the average daily traffic on the entire network is 85% of the average weekday daily traffic on the entire network.

### 2.1.2.3 Conclusion

Based on traffic modeling and the anticipated future growth and planned development in the study area, a highway alternative would meet the project's primary purpose of providing a regional transportation facility and would also reduce some traffic on existing and future arterial roads and accommodate future planned developments. Additionally, a highway alternative would improve mobility in the area and reduce travel times, costs, and congestion on the roadways south and east of I-15. Provided below is a discussion of the development of alignments to meet the project need.

### 2.1.3 Induced Demand and Latent Demand

The terms *latent demand* and *induced demand* are often used interchangeably to mean that the construction of new or improved transportation facilities would encourage additional and/or longer automobile trips. At times these terms also encompass a concept of "sprawl growth" or "induced growth," meaning new growth that has been encouraged by new or improved transportation facilities. Both latent and induced demand are intended to capture vehicle trips that could be generated by the new or improved roadways. Some analysts identify the following three aspects of latent and induced demand:

1. **Longer Trips.** The new or improved facility may cause changes in land use, generating trips by allowing people to travel longer distances to their destinations. For example, growth projected in a region may spread farther if there is adequate transportation.
2. **New Trips.** A lessening of congestion might change transportation habits, generating new vehicle trips. For example, people might move their homes, jobs, or services to a new area if adequate transportation were to exist.
3. **Optional Trips.** Congestion might discourage certain kinds of trips that would be taken if roadways were less congested. For example, people might choose to attend a 7:00 PM movie if rush hour traffic were less congested.

This EIS measures these three categories of potential trips using the latent demand analysis described below.

***Latent Demand.*** When distinguished from induced demand, latent demand refers to additional vehicle trips generated by the projected population growth. These are trips that would be taken by the projected population if there were no impediments to travel, such as roadway congestion. Latent demand measures trips in the population, but only trips that would be taken if improved roadways

exist. Latent demand does not isolate the specific growth or transportation habits that account for additional trips.

***Induced Demand.*** In contrast, induced demand refers to isolating and analyzing the new trips that are attributable to the particular changes in growth resulting from the new or improved roadways. The concept of induced demand distinguishes the contribution of transportation investments from other actions, such as population increases.

Whether used interchangeably or separately, latent and induced demand attempt to measure how highways affect growth. However, the research literature is not consistent on this basic issue.

***1999 GAO Study.*** The U.S. General Accounting Office (GAO) recently studied these growth issues at the request of the U.S. Congress. In April 1999, GAO issued a report, *Community Development: Extent of Federal Influence on "Urban Sprawl" Is Unclear*, which concluded that the relationship between highway spending and induced growth or sprawl is unclear and complex (GAO 1999). Urban growth patterns are accounted for by many demographic and social factors that are unrelated to roadways. The relationships among these factors are so complex that researchers have had great difficulty isolating the impact of any individual factor, such as highway spending.

Other reports have concluded that there is a relationship between highways and where growth will occur. A report prepared for the Brookings Institution concluded that highways influence where growth will occur, and the gain in some areas is at the expense of other locations, which may cause decentralization of cities (Boarnet and Haughwout 2000).

The National Cooperative Highway Research Program concluded that in order for a change in transportation to generate a significant shift in land use, the transportation change must affect the accessibility enough to generate a change in the land use. For example, locations near interchanges are made more accessible and some shift in travel patterns occurs. As travelers make more trips to a specific location, development pressure intensifies, which leads to increased land values and competition for the site rises (provided that land use policies allow the change in land uses near the interchange). The magnitude of change in land use depends on how much accessibility is improved, the relative attractiveness of the location near the interchange, and the real estate market in the region (Parsons Brinckerhoff Quade & Douglas, Inc. 1998).

***Quantifying Induced Demand.*** Recently, several research projects have been conducted to quantify induced demand resulting from highways. These efforts have varied in their approach and results.

*Goodwin.* Phil Goodwin (1996) presents empirical data on conditions on nine improved roads in the United Kingdom, suggesting that after the first year, traffic was 5.7% higher than forecasted by models for the time after the first year. The analysis did not investigate whether this higher level of traffic was diverted from parallel routes.

*Heunue.* Kevin Heunue (no date) uses travel time from several sources, including work in the United Kingdom and elsewhere, to show that capacity additions may be related to growth in trips. He states that between 7% and 22% of the growth in the amount of miles traveled may be explained by capacity expansion.

*DeCorla-Souza.* Patrick DeCorla-Souza and Harry Cohen (1998) use travel time to show that a 10% reduction in time may lead to a 5% increase in vehicle-miles traveled (VMT) in a corridor.

*Noland.* Robert Noland and William Cowart (2000) relate the growth in travel to the growth in lane-miles of roadway. Noland uses statistics of existing and added lane-miles of many major U.S. cities (at the regional level) to relate to an increase in VMT. His models and equations develop a relationship of a 0.5% to 0.7% increase in VMT for each 1% increase in lane-miles.

*Fulton.* Lewis Fulton and colleagues (2000) conducted analyses in rural and urban areas in the mid-Atlantic region and found that for each 1% increase in lane-miles, an increase of 0.56% to 0.59% in VMT will result. These results are in areas with low density (fewer than 100 persons per acre). The greatest population density studied was 500 persons per acre, which showed a 0.415% increase in the amount of miles traveled for each 1% increase in lane-miles. Like Washington County, the areas analyzed in this study did not have transit service available.

#### **2.1.3.1 Applicability to Southern Corridor**

The above studies reflect the ongoing efforts to develop methodologies to measure induced growth or induced demand. However, it is important to note that the circumstances in this research literature cannot easily be related to the unique conditions in the Southern Corridor. The unique conditions in the area include I-15's being the only existing, continuous, through roadway throughout the entire length of the corridor and the numerous physical constraints that limit the effectiveness of existing arterial roadways. No similar physical constraints or other characteristics like those in the Southern Corridor are evident in the studies of induced travel, making it difficult to transfer the study results. In addition, the studies reflect the lack of consensus within the discipline on measurement tools.

The QRSII modeling software does assess network VMT and VHT. These values give an indication of the average length of trips for both distance and time. To assess the differences in VMT and VHT for the Southern Corridor, capacity-constrained networks for the No-Build and build alternatives were compared. The results of the comparison are given in Table 2.1-3.

**Table 2.1-3. Build versus No-Build VMT, VHT, and Average Speed (Capacity Constrained)**

	<b>No-Build Alternative</b>	<b>4300 West Alternative</b>	<b>3400 West Alternative</b>	<b>2800 West Alternative</b>	<b>Average Build Difference (%)</b>
VMT (miles)	4,675,589	5,195,102	5,221,855	5,168,917	11.1
VHT (hours)	214,455	198,810	198,217	196,763	-7.7
Average speed (mph)	21.8	26.1	26.3	26.3	20.6

Table 2.1-3 shows that the total network VMT for the average of the three build alternatives would increase 11.1% over the No-Build Alternative. This could be interpreted to mean the average trip length would increase by 11.1% due to induced demand because the Southern Corridor would allow a higher speed and would have a longer connection between productions and attractions than do the existing arterial streets. The 11.1% increase in VMT is consistent with some of the induced demand studies which show an increase in VMT of between 5% and 22% with increase in capacity. When the QRSII model assigns trips to the roadway network, it does so according to travel time and considers a longer trip with reduced travel time to be more attractive than a shorter trip with longer travel time, as evidenced by the accompanying decrease in VHT and increase in average network speed. These two numbers could be interpreted to mean that the average trip length measured in hours decreases 7.7% and that the speed of the average trip increases 20.6%. Although the VMT are greater in the three build alternatives, they are at a much greater speed for less time.

Because the relationship of highway investments to growth patterns is a subject of ongoing research and public discussion, this EIS simply identifies the issues related to induced growth and induced demand to assist the public and the decision-makers. Construction of the Southern Corridor would have some impact on the types of growth patterns in the study area (that is, commercial versus residential) and would induce the growth of VMT.

## **2.1.4 Southern Corridor Alignment Alternatives**

### **2.1.4.1 Initial Screening of Regional Alignments**

As part of the initial screening process, potential regional alignment options that would meet the project's purpose and need were studied. Based on the purpose

and need for a proposed facility to operate as a regional facility for traffic between St. George, Washington City, and Hurricane, to be compatible with land use plans, and to improve mobility and access to planned development, an alignment was selected south and east of I-15. The area south and east of I-15 is the area where the most growth is expected. This alignment option was consistent with the cities' land use plans. This regional alignment was the only option that would meet the need of the project; see Figure 2-3, Regional Alignment.

**Roadway Termini.** I-15 is the major north-south highway through Utah. The location of I-15 just north of Atkinville Wash is a logical terminus based on the importance of I-15 to the regional transportation network. SR 9 is the main connection between I-15, Hurricane, Zion National Park, and access to SR 59. The Southern Corridor connection at SR 9 is also a logical terminus since SR 9 is the major east-west corridor through this part of Utah. As defined, the Southern Corridor would be an independent highway that would not require the implementation of other roadway projects in order to be usable.

#### **2.1.4.2 Development of Alignment Alternatives**

Alternative roadway alignments were developed within the regional alignment between the roadway termini. Alignment alternatives were developed by gathering and evaluating technical information within the regional alignment. Provided below is a description of the criteria used to evaluate alignment alternatives.

#### **Environmental Resource Considerations**

Alignment alternatives were developed in consideration of environmental resources by gathering and evaluating technical information on the location of farmlands, wetlands, floodplains, threatened and endangered species (including habitat), and cultural resources and by soliciting input from the public and resource agencies during the NEPA process. The alignments were modified where necessary to minimize impacts to sensitive plant habitat, cultural resources, and natural springs.

#### **Engineering Considerations**

**Preliminary Design.** To compare the alignment alternatives, all build alternatives were assumed to be limited-access roadways on a new alignment. The preliminary design standards used for all build alternatives are listed below in Table 2.1-4, Design Standards—Roadway, and Table 2.1-5, Design Standards—Interchanges. The proposed typical section is shown in Figure 2-4, Typical Section.

**Table 2.1-4. Design Standards—Roadway**

Parameter	Standard
Design year	2030
Level of service	D
Access control	Limited
Terrain	Rolling
Maximum grade, mainline	6%
Design speed, mainline	70 mph
Lane width, mainline	12 feet
Minimum median width	60 feet
ROW width, mainline <sup>a</sup>	300 feet

<sup>a</sup> See Section 2.2.2, 4300 West Alternative, regarding ROW requirements.

**Table 2.1-5. Design Standards—Interchanges**

Ramp Type	Design Speed (mph)	Minimum Radius (ft)	Maximum Grade
Directional (at termini)	70	1,850	6%
Diamond:			
Gore	70	1,850	6%
Body	50	820	
Terminal	35	375	

**Groundwork.** During the review, the topographic features were studied to identify the alignment area that would best minimize construction costs and to identify groundwork such as slope, cut and fill, and drainage.

**Relocations.** A key consideration was minimizing relocations, defined as residences, businesses, and farmsteads within the ROW. A farmstead is a group of buildings that support farming operations.

**Utility Lines.** Utility lines include those for power, natural gas, liquid petroleum, and communications.

**Section 4(f) Properties.** Section 4(f) properties are significant public-owned parks, recreation areas, wildlife refuges, and historic sites. See Chapter 5, Section 4(f) Evaluation, for more information on these properties.

Numerous archaeological sites found along the corridor were determined to be 4(f) properties. These sites were avoided.

**Planned Growth.** One of the needs for the Southern Corridor is to provide access to expected planned development as the area continues to grow. As part of the planned analysis, developments and city and county land use plans were

considered. Some of the developments have been platted and submitted to city and county planning agencies.

### 2.1.4.3 Alignment Alternatives Evaluated

***Southern Corridor Partnering Session.*** On April 6, 1999, UDOT held a partnering session with federal and state agencies, local county and city officials, and the public to discuss the Southern Corridor and to gather input on potential alignments. The meeting was attended by about 45 people, who were divided into five working groups to develop alignments. Prior to the development of alignments, a map showing environmental constraints such as washes, sensitive plant habitat, cultural resources, and geotechnical constraints was shown to the group to consider while developing alternatives. During the meeting, various alignment options were developed and considered, as discussed below.

***Alternative Alignments Developed.*** Based on the results of the meeting and further engineering and environmental constraints, the alignments shown in Table 2.1-6 were developed for further study (also see Figure 2-5, Alignment Alternatives Evaluated). To facilitate the development of alignments, the corridor was divided into two sections: from I-15 to the proposed airport and from the proposed airport to SR 9.

**Table 2.1-6. Summary of Considered Alignments**

Alignment	Distance by Segment (miles)	Relocations	Traffic Volume (ADT)	Section 4(f) Impacts
<b>I-15 to Airport</b>				
A	10	0	20,015–30,470 <sup>a</sup>	0
Modified A	10	0	20,015–30,470 <sup>a</sup>	0
B	10.5	0	20,015–30,470 <sup>a</sup>	0
<b>Airport to SR 9</b>				
A	11.5	4	39,403	0
C	12.5	2	39,403	0
D	16	1	19,293	0
E	10	1	30,470	0

<sup>a</sup> Traffic volumes at the southern end of the alignment depend on the connection at SR 9 and vary between 20,015 (Alignment D), 28,481 (Alignments A and C), and 30,470 (Alignment E).

#### **2.1.4.4 I-15 to Vicinity of Proposed Airport (Alignments A, Modified A, and B)**

To develop an alignment from I-15 to the proposed St. George replacement airport, sensitive plant habitat, topography, and the Atkinville Wash were considered along with future land use and transportation plans. Plant habitat was avoided to the maximum extent practical while also considering the floodplain of the Atkinville Wash and topographic features that would not reasonably accommodate current design standards. To avoid sensitive plant habitat, one suitable location was identified for the Southern Corridor connection to I-15 near the Atkinville Wash between areas of bearclaw poppy habitat. Other locations north or south of I-15 would have resulted in more impacts to habitat.

Only one reasonable alignment east of I-15 would avoid sensitive plant habitat, the floodplain of the Atkinville Wash, and topographic features while providing an alignment consistent with land use plans. This alignment avoids sensitive plant habitat to the maximum extent practical by going south of the major habitat areas of Holmgren milkvetch and bearclaw poppy. An alignment farther west of the Holmgren milkvetch habitat would impact the floodplain of the Atkinville Wash. An alignment to the northeast would locate the alignment in a topographic feature with steep grades (Price City Hills), would not be consistent with land use plans, and would result in out-of-direction travel to the proposed St. George replacement airport. Out-of-direction travel would result in longer travel times, additional cost to the user, and possibly less use of the roadway if a quicker route is available. The alignment in this area was coordinated with USFWS and BLM during Southern Corridor agency meetings.

Three alignments were identified near the proposed airport, through private lands owned by Leucadia and Klein corporations and public lands administered by BLM, where the corridor bends from east-west to a north-south direction. These options include the original Alignment A, a modified Alignment A (to the east of the original alignment), and Alignment B.

As a result, the original Alignment A was dropped since it passed too close to the safety perimeter of the proposed St. George replacement airport and was less compatible with development plans for the Klein and Leucadia properties. Alignment B was dismissed because of the out-of-direction travel of about 0.5 mile and the impacts on Leucadia's property. Modified Alignment A was the one most supported by both developments because it best fit the developments' conceptual development plans. None of the three alignments affected utilities or caused relocations.

#### **2.1.4.5 Proposed Airport to SR 9 (Alignments A, C, D, and E)**

Four options were considered between the proposed airport and the connection with SR 9: Alignments A, C, D, and E. Alignments A and C provide access to the same development properties and terminate at the same location on SR 9. Review of these two alignments showed that Alignment C was about 1 mile longer in length; required more slope, cut, and fill; and would conflict with the Sand Hollow Reservoir, since the road alignment is within the lake boundary. Based on these facts, Alignment C was eliminated from further study and Alignment A was carried forward for further analysis.

Alignment D would connect to SR 9 farther east than Alignment A and would provide access to the Sand Hollow Reservoir. Although the volume of traffic for Alignment D would be lower than for the other alignments, this alignment would meet the purpose and need of providing a regional facility with access to expected development. Alignment D was also carried forward for analysis.

Alignment E would provide access to the same development properties as Alignments A and C. Alignment E would have the shortest length of all of the proposed alignments and is best suited to minimize impacts to future developments. In addition, Alignment E would require the least amount of groundwork. Alignment E was also carried forward for analysis. All alignments were placed to minimize impacts to Holmgren milkvetch habitat and to avoid Willow Springs and topographic features such as Warner Ridge, Washington Dome, and the floodplain of the Virgin River.

#### 2.1.4.6 Other Alignment Options Considered

After the initial scoping period and public meetings, an additional alignment option was brought forward for the I-15 connection to the Southern Corridor. Although the build alternatives developed for the Southern Corridor had been placed to avoid or minimize impacts to habitat for sensitive plant species, another alignment that would be located to the north of the 2.3 acres of Holmgren milkvetch habitat impacted by the build alternatives was identified by the public (see Figure 2-6, Other Alternative Considered). This alignment was not carried forward for the following reasons:

- It would avoid the 2.3 acres of Holmgren milkvetch habitat impacted under the build alternatives but would impact an additional 37 acres of bearclaw poppy habitat identified by BLM.
- The out-of-direction travel for the alignment would minimize the primary purpose of the Southern Corridor's use as a regional facility between St. George, Washington City, and Hurricane.
- It would not align with other proposed transportation improvements identified in the St. George Transportation Master Plan, including the Atkinville interchange and associated road south and west of I-15.
- It would not be compatible with the St. George land use plan. The alternative would be located next to existing and planned residential development near I-15. The current proposed Atkinville interchange alignment is undeveloped, allowing the City to plan for appropriate land use around the Southern Corridor. The new alternative would be next to the noncompatible land use of residential development.
- It would take additional ROW that the City and the School and Institutional Trust Lands Administration (SITLA) have identified for industrial development along River Road, would separate part of the existing and future planned cohesive community, and would create a high-speed transportation facility through or near residential neighborhoods.

In conclusion, because this alignment option would result in additional impacts to bearclaw poppy habitat and would not meet the primary purpose of the project as a regional facility because of the out-of-direction travel, it was not carried forward for detailed analysis. In addition, the alignment would not be consistent with the local and regional transportation and land use plans.

### 2.1.4.7 Alignment Alternatives Conclusion

Based on the above evaluation of alignments, modified Alignment A from I-15 to the airport and Alignments A, D, and E from the airport to SR 9 were carried forward for analysis. For purposes of this analysis, these alignments are the 3400 West Alternative (Alignments A and Modified A), the 2800 West Alternative (Alignments Modified A and D), and the 4300 West Alternative (Alignments Modified A and E).

## 2.2 Alternatives Considered

To further refine the alternatives after field studies were completed, additional screening of the build alternatives was conducted. The key categories of concern were wetlands, threatened and endangered species, and cultural resources. Each of these resources was reviewed against the alignments, and modifications were made to minimize impacts—for example, avoiding archaeological sites and threatened and endangered species habitat for the bearclaw poppy and Holmgren milkvetch. In addition, both the 4300 West and 3400 West Alternatives were modified to the west to avoid Willow Springs, a natural wetland in the area that provides important wildlife habitat.

**Cost and Implementation of Build Alternatives.** For analysis purposes, a preliminary cost estimate for the Southern Corridor was developed and is shown in Table 2.2-1.

**Table 2.2-1. Preliminary Southern Corridor Cost Estimate**

Description	4300 West Alternative	3400 West Alternative	2800 West Alternative
Right-of-way	\$7,940,000	\$9,610,000	\$7,480,000 <sup>a</sup>
Construction <sup>b</sup>	\$153,520,000	\$142,030,000	\$201,680,000
Total	\$161,460,000	\$151,640,000	\$209,160,000

<sup>a</sup> Although the 2800 West Alternative has the longest ROW, costs are reduced because the Washington County Water Conservancy District would donate parts of the ROW around the Sand Hollow Reservoir. Also, the land along the alignment is not subdivided.

<sup>b</sup> Construction estimates include the Atkinville interchange and the Southern Corridor. Because the exact location and number of interchanges along the Southern Corridor could change, the costs are not included. The expected cost per interchange would be about \$10,000,000.

Currently, there are no funds appropriated for acquiring ROW or constructing the Southern Corridor except for the Atkinville interchange at I-15. This interchange is partially funded in the STIP for \$8,000,000. Future funding sources for the Southern Corridor may be available from local cities, the State of Utah, and the federal government. The Southern Corridor would likely become a state road.

The Southern Corridor would be constructed in phases based on need. The timing of the construction would depend greatly on when the area begins to develop, which is difficult to forecast. The first phase would likely be constructed by the time the St. George replacement airport is completed in 2010. The proposed Atkinville interchange could be constructed after approval of this EIS, depending on local funding. The road would initially start as a limited-access, two-lane road from I-15 to the airport with at-grade intersections (traffic signals). Access to the road would be at intersections only, and the non-intersection portions of the ROW would be fenced. When traffic demand warrants, the highway would be expanded to become a four-lane, limited-access highway with access being provided at interchanges. The second phase would likely be constructed starting at SR 9 and would eventually link to the St. George replacement airport. Construction of this phase would be after 2010 and would also start as a two-lane limited access road. This road would be upgraded to a limited-access highway when traffic demand warrants based on when the area develops.

After approval of the Final EIS, St. George, Washington City, and Hurricane would adopt in their master plans and zoning the preferred alternative to preserve the corridor. Much of the preservation would require coordination between the cities and developers, private landowners, and SITLA. ROW on BLM-administered public land would be preserved until construction is initiated. BLM would transfer the ROW to FHWA. The Southern Corridor could qualify for state corridor preservation funds.

***Build Alternative Interchange Locations.*** Potential interchange locations are provided for each build alternative. The locations are based on discussion with St. George, Washington City, Hurricane, Washington County, developers, and other local agencies. Since the area is not developed, the actual location of the final number and location of interchanges may change based on final growth/development patterns. Therefore, the interchanges in this EIS, except the Atkinville interchange, are preliminary but have been included to provide the public and decision-maker with information on how the highway might develop. The ROW required for each interchange has been included for analysis in this EIS. As the Southern Corridor is developed in the future, appropriate environmental documentation will be conducted to analyze any potential modifications from what is presented in this EIS. UDOT and the local communities would make final approval of interchange locations. See Section 4.1, Land Use Impacts, for potential impacts associated with interchange locations.

### **2.2.1 No-Build Alternative**

The Council on Environmental Quality regulations (CEQ 1981) require that an EIS include a “no-action” (or “no-build”) alternative which, in this case, consists of not building the Southern Corridor. The No-Build Alternative would consist of improving and expanding the existing arterial system to meet future growth. The No-Build Alternative would be implemented as part of the cities’ future transportation planning to meet the expected growth by providing access to new developments as they are built. The major roadway projects anticipated for the future under the No-Build Alternative near the proposed Southern Corridor are as follows.

#### **Washington City Improvements**

- Extend/improve Washington Field Road (five-lane major arterial) from I-15 to replacement airport.
- Widen Telegraph Road to five lanes in Washington City.
- Widen 300 East (downtown Washington City to RP 13 interchange).
- Construct an interchange on I-15 at RP 13.

#### **Hurricane Improvements**

- Complete 600 North from SR 9 at 3400 West to SR 9 at 600 North.
- Construct 4300 West from SR 9 to Sand Hollow Reservoir access.
- Construct 2800 West from SR 9 to Sand Hollow Reservoir access.
- Construct 3400 West south of SR 9.

#### **St. George Improvements**

- Widen River Road to five lanes from Riverside Drive to Arizona border.
- Construct road to south end of replacement airport.
- Realign 1450 South from River Road to 3000 East.
- Widen Riverside Drive from Foremaster to 400 East.
- Widen Bloomington Drive, entire loop.
- Widen Brigham Drive from River Road to I-15.

The above improvements are in the cities' long-range transportation plans and are included as part of the No-Build Alternative. Other minor roads would be built as needed to accommodate development associated with growth in the area. Because many of the developments have not been planned, it is impossible to determine the future locations of these roads. Table 2.2-2 provides a summary of what changes would be required for the major existing road network under the No-Build Alternative if the Southern Corridor is not built.

**Table 2.2-2. Comparison of No-Build and Build Alternatives 2030 Road Network**

<b>Roadway Segment</b>	<b>No-Build Alternative (without Southern Corridor)</b>	<b>Build Alternatives (with Southern Corridor)</b>
River Road at Brigham Road	7 lanes	5 lanes
2450 South at Little Valley	5 lanes	3 lanes
Brigham Road at River Road	5 lanes	3 lanes
3000 East at 1450 South	5 lanes	3 lanes
Little Valley at 2450 South	5 lanes	3 lanes
2450 East (Riverside to 2000 S.)	5 lanes	3 lanes
I-15 Green Springs to RP 13	6 lanes	4 lanes
SR 9 at 1760 West	5 lanes	7 lanes
I-15 Brigham to Bluff	4 lanes	6 lanes

In addition to the changes noted above to the existing road network, the No-Build Alternative would likely result in the following changes:

- River Road would be designated a major arterial instead of a minor arterial.
- A new frontage road that would parallel the Southern Corridor in St. George would be developed into a major arterial.
- The Atkinville interchange would not be built.
- A new north-south road west of the St. George replacement airport would be designated a major arterial instead of a minor arterial.
- Both 4300 West and 2800 West in Hurricane would become major arterials instead of minor arterials.

The City of St. George noted that, under the No-Build Alternative, many of the smaller north-south roads that would be developed would need to be widened to carry a larger volume of traffic. Overall, the roadway network under the No-Build Alternative would be similar to the build alternatives except that some of

the roadways would need to be widened to accommodate the traffic that would have been carried by the Southern Corridor.

Figure 2-7, No-Build Alternative Roadway Network, and Figure 2-8, Build Alternatives Roadway Network, depict how the road network would develop differently under the No-Build and build alternatives. Because the road network depicted in the figures is not currently planned and has not been fully developed, potential environmental impacts would be considered, as required, once the cities determine the need for the roadway.

### 2.2.2 4300 West Alternative

The 4300 West Alternative (Alignments Modified A and E) would be a four-lane, limited-access divided highway with a 60-foot-wide median. The ROW width required for the Southern Corridor would be 300 feet. This width is required to provide room for the trail system and to accommodate the cut-and-fill requirements for the highway. Because of the varying terrain of washes and mesas, the highway would require large cuts which would encompass most of the ROW. Additionally, easements would be necessary where cut-and-fill extend beyond the ROW.

The overall ROW is based on UDOT and AASHTO design standards for travel lanes, median, and clear zones for a rural highway that were current at the time the design was developed for the EIS. These design standards take into account factors such as roadway safety. A wide median without a barrier as proposed for the Southern Corridor results in a 92% reduction in accidents compared to a 14-foot median with a concrete barrier, which is typically found in developed urban areas such as I-15 in Salt Lake City. The Southern Corridor would likely be built in phases, first as a signalized roadway, then converted into a limited-access highway as traffic increases.

**Project Features.** As shown in Figure 2-9, Southern Corridor 4300 West, 3400 West, and 2800 West Alternatives, the 4300 West Alternative consists of a new 300-foot-wide corridor. Starting at the proposed I-15 interchange just north of Atkinville Wash and extending to the intersection of 4300 West with SR 9 in Hurricane, the project is best described in three sections.

- The southern section passes through undeveloped areas south of White Dome along the Utah-Arizona border, intersecting River Road and continuing to Fort Pearce Wash. This section would include a diamond or similar interchange on I-15 2 miles north of the Arizona border (Atkinville interchange) including a four-lane road 850 feet north of the proposed interchange connecting to Sun River Parkway at Pioneer Road. The Atkinville interchange would also provide access to the Utah

welcome center through a revised off ramp. The welcome center could also be moved into an existing facility in St. George.

- The central section passes east of the St. George replacement airport, parallels Warner Ridge, and heads north towards the Virgin River. Near the future Redhawk subdivision, 4700 East is intersected by the 4300 West Alternative and parallels it from this point before turning west and becoming 2000 South. From this point, the 4300 West Alternative parallels the Dixie-Escalante utility road to the Washington Dam Road.
- The northern section proceeds northeast along the Turf Sod Road and continues north on the west side of the proposed Dixie Springs and Outlaw Ridge subdivisions. The alignment connects to SR 9 at the intersection of 4300 West. At this intersection, SR 9 would need to be relocated farther south to minimize safety concerns with line-of-sight distances.

Based on current land use projections, interchanges could be at the following locations:

- I-15 at the Atkinville Wash
- About 2 miles southeast of I-15
- River Road
- Leucadia development
- Southwest end of St. George replacement airport
- Northeast end of St. George replacement airport; access road to BLM Warner Valley access road (would require realignment of frontage road)
- Washington City
- Washington Dam Road about 3 miles south of SR 9
- About 2.5 miles south of SR 9
- About 1 mile south of SR 9
- SR 9 at 4300 West

Other underpasses, overpasses, and final interchange locations would be identified as growth continues in the area and access is needed for planned development. Proposed interchanges would require a 400-foot ROW to be constructed. Dry washes must be crossed in a manner that allows for proper drainage. The Fort Pearce Wash structure would be designed such that the crossing would span the riparian area and accommodate hydraulic capacity for the 100-year flood event. The abutments would be outside the riparian area. Detention basins would be located throughout the project to retain storm water runoff.

**Trail.** The non-motorized trail for pedestrians, bicyclists, and equestrians would parallel the Southern Corridor and would be provided for within the ROW. The trail would be dirt and would have access points at the interchanges.

### 2.2.3 3400 West Alternative

The 3400 West Alternative (Alignment Modified A) would have a typical roadway section similar to that of the 4300 West Alternative and would be an entirely new highway. The trail would be within the same limits and would have the same characteristics as noted above for the 4300 West Alternative.

**Project Features.** The southern terminus of the 3400 West Alternative, around the St. George replacement airport and along Warner Ridge, would be the same as the 4300 West Alternative (see Figure 2-9, Southern Corridor 4300 West, 3400 West, and 2800 West Alternatives). The northern section proceeds along Turf Sod Road to Willow Springs, then east to Flora Tech Road where it passes through the future planned developments of Dixie Springs and Outlaw Ridge before proceeding north to SR 9 near 3400 West.

Based on current land use projections, interchanges could be at the following locations:

- I-15 at the Atkinville Wash
- About 2 miles southeast of I-15
- River Road
- Leucadia development
- Southwest end of St. George replacement airport
- Northeast end of St. George replacement airport; access road to BLM Warner Valley access road (would require realignment of frontage road)
- Washington City
- Washington Dam Road
- About 2.5 miles south of SR 9
- About 1 mile south of SR 9

Other underpasses, overpasses, and final interchange locations would be identified as growth continues in the area and access is needed for planned development. Proposed interchanges would require a 400-foot ROW to be constructed. Dry washes must be crossed in a manner that allows for proper drainage. The Fort Pearce Wash structure would be designed such that the crossing would span the riparian area and accommodate hydraulic capacity for the 100-year flood event. The abutments would be outside the riparian area.

Detention basins would be located throughout the project to retain storm water runoff.

**Trail.** The non-motorized trail for pedestrians, bicyclists, and equestrians would parallel the Southern Corridor and would be provided for within the ROW. The trail would be dirt and would have access points at the interchanges.

#### 2.2.4 2800 West Alternative (Preferred Alternative)

The 2800 West Alternative (Alignments Modified A and D) would have a typical roadway section similar to that of the 4300 West Alternative and would be an entirely new highway. The trail would be within the same limits and would have the same characteristics as noted above for the 4300 West Alternative.

**Project Features.** The southern terminus of the 2800 West Alternative, near the St. George proposed airport and along Warner Ridge, would be the same as for the 4300 West Alternative (see Figure 2-9, Southern Corridor 4300 West, 3400 West, and 2800 West Alternatives). From this point, the 2800 West Alternative would proceed east around the Sand Hollow Reservoir, then head north and connect to SR 9 at 2800 West.

Based on current land use projections, interchanges could be at the following locations:

- I-15 at the Atkinville Wash
- About 2 miles southeast of I-15
- River Road
- Leucadia development.
- Southwest end of St. George replacement airport
- Northeast end of St. George replacement airport. Access Road to BLM Warner Valley access road (would require realignment of frontage road)
- Washington City
- Washington Dam Road
- Southwest of Sand Hollow Reservoir
- Northeast of Sand Hollow Reservoir
- About 2 miles south of SR 9
- About 1 mile south of SR 9

Adjacent to the Sand Hollow Reservoir, underpasses would be provided to allow recreational access between the reservoir and the BLM Sand Mountain Special Recreation Management Area (SRMA). These underpasses would be located in coordination with BLM once recreational plans are developed. Other

underpasses, overpasses, and final interchange locations would be identified as growth continues in the project area and access is needed for planned development.

Proposed interchanges would require a 400-foot ROW to be constructed. Dry washes must be crossed in a manner that allows for proper drainage. The Fort Pearce Wash structure would be designed such that the crossing would span the riparian area and accommodate hydraulic capacity for the 100-year flood event. The abutments would be outside the riparian area. Detention basins would be located throughout the project to retain storm water runoff.

*Trail.* The non-motorized trail for pedestrians, bicyclists, and equestrians would parallel the Southern Corridor and be provided for within the ROW. The trail would be dirt and would have access points at the interchanges.

## **2.3 Land Acquired to Date**

No ROW has been purchased for the Southern Corridor. However, the Leucadia development has committed ROW for the Southern Corridor.

## **2.4 Comparison of Impacts**

A summary comparison of the environmental impacts for the alternatives for each resource affected over the study period is provided below in Table 2.4-1. Impacts to the environment are described briefly in the summary and are discussed in detail in Chapter 4, Environmental Consequences. Potential mitigation measures for the impacts are summarized in Section 4.23, Mitigation Summary. Provided below is a summary of the advantages and disadvantages of the alternatives.

Table 2.4-1. Comparison of Environmental Impacts

Resource Category	No-Build Alternative	4300 West Alternative	3400 West Alternative	2800 West Alternative (Preferred Alternative)
<b>Land Use</b>	<p>The general land use character in the project area would change from rural to urban.</p> <p>This alternative is not consistent with the Washington City and St. George land use plans. It is consistent with the Hurricane and Washington County land use plans.</p>	<p>The general land use character in the project area would change from rural to urban. Changes in land use could occur faster along the Southern Corridor than under the No-Build Alternative.</p> <p>This alternative is consistent with the Washington City and St. George land use plans. It is not identified in Hurricane and Washington County land use plans. However, Hurricane and County planners support the project. The project is in conformance with the BLM Resource Management Plan.</p>	<p>The general land use character in the project area would change from rural to urban. Changes in land use could occur faster along the Southern Corridor than under the No-Build Alternative.</p> <p>This alternative is consistent with the Washington City and St. George land use plans. It is not identified in Hurricane and Washington County land use plans. However, Hurricane and County planners support the project. The project is in conformance with the BLM Resource Management Plan.</p>	<p>The general land use character in the project area would change from rural to urban. Changes in land use could occur faster along the Southern Corridor than under the No-Build Alternative.</p> <p>This alternative is consistent with the Washington City and St. George land use plans. It is not identified in Hurricane and Washington County land use plans. However, Hurricane and County planners support the project. The project is in conformance with the BLM Resource Management Plan.</p>
<b>Farmland</b>	Development of local roads would likely affect less than 10 acres. No impacts to grazing allotments.	1 acre of unique farmland affected; 257 acres of grazing allotments directly affected. Indirect impacts caused by bisecting allotments.	50 acres of prime farmland affected; 257 acres of grazing allotments directly affected. Indirect impacts caused by bisecting allotments.	No farmland affected; 385 acres of grazing allotments directly affected. Indirect impacts caused by bisecting allotments.
<b>Social Environment</b>	No environmental justice impacts expected. Community cohesion would decrease without a regional transportation facility. The lack of a regional transportation facility would affect travel patterns and accessibility in the project area. Local transportation projects would not affect recreational resources.	No environmental justice impacts. No change in community cohesion. This alternative would improve overall travel patterns and accessibility in the project area. It would affect access to 2 trails and use of 1 recreation site.	No environmental justice impacts. No change in community cohesion. This alternative would improve overall travel patterns and accessibility in the project area. It would affect access to 2 trails and use of 1 recreation site.	No environmental justice impacts. No change in community cohesion. This alternative would improve overall travel patterns and accessibility in the project area. It would affect access to 3 trails and the Sand Mountain Recreation Area and use of 1 recreation site.
<b>Relocations</b>	No relocations expected.	1 residential relocation.	4 residential relocations.	1 residential relocation.

Resource Category	No-Build Alternative	4300 West Alternative	3400 West Alternative	2800 West Alternative (Preferred Alternative)
<b>Economics</b>	Could result in economic impacts by not providing a regional transportation facility to improve mobility between St. George, Washington City, and Hurricane.	This alternative could result in positive economic impacts by improving mobility to the southern part of the study area where growth is expected. The Southern Corridor would result in small bypass impacts to local cities.	This alternative could result in positive economic impacts by improving mobility to the southern part of the study area where growth is expected. The Southern Corridor would result in small bypass impacts to local cities.	This alternative could result in positive economic impacts by improving mobility to the southern part of the study area where growth is expected. The Southern Corridor would result in small bypass impacts to local cities.
<b>Joint Development</b>	No joint development potential.	Southern Corridor pedestrian and bicycle trail would be incorporated into the local trail system. Highway would be jointly coordinated with BLM.	Southern Corridor pedestrian and bicycle trail would be incorporated into the local trail system. Highway would be jointly coordinated with BLM.	Southern Corridor pedestrian and bicycle trail would be incorporated into the local trail system. Highway would be jointly coordinated with BLM.
<b>Considerations Related to Pedestrians and Bicyclists</b>	Southern Corridor trail would not be constructed. Continued increase in the number of pedestrian and bicycle trails.	Southern Corridor trail implemented along with other trails in the project area.	Southern Corridor trail implemented along with other trails in the project area.	Southern Corridor trail implemented along with other trails in the project area.
<b>Air Quality</b>	No change expected in current attainment status. Vehicle-related emissions for particulate matter (PM <sub>10</sub> ), nitrogen oxides (NO <sub>x</sub> ), and sulfur dioxide (SO <sub>2</sub> ) would be less than under the build alternatives. Volatile organic compounds (VOCs) and carbon monoxide (CO) emissions would be slightly greater than under the build alternatives.	National Ambient Air Quality Standards would not be exceeded. Increase in PM <sub>10</sub> , NO <sub>x</sub> , and SO <sub>2</sub> compared to the No-Build Alternative. Highest overall emissions of the build alternatives.	National Ambient Air Quality Standards would not be exceeded. Increase in PM <sub>10</sub> , NO <sub>x</sub> , and SO <sub>2</sub> compared to the No-Build Alternative.	National Ambient Air Quality Standards would not be exceeded. Increase in PM <sub>10</sub> , NO <sub>x</sub> , and SO <sub>2</sub> compared to the No-Build Alternative. Lowest overall emissions of the build alternatives.
<b>Noise</b>	Noise levels around local transportation projects would increase. The noise environment in the general project area would change from rural to urban. Noise levels near Warner Ridge would likely remain rural.	Southern Corridor would increase noise levels on adjacent land. The noise environment would change from rural to urban. Noise levels would exceed 65 dBA, or would increase by 10 dBA or more, at 7 noise-sensitive receptors.	Southern Corridor would increase noise levels on adjacent land. Noise levels would exceed 65 dBA, or would increase by 10 dBA or more, at 7 noise-sensitive receptors.	Southern Corridor would increase noise levels on adjacent land. Noise levels would exceed 65 dBA, or would increase by 10 dBA or more, at 7 noise-sensitive receptors.

Resource Category	No-Build Alternative	4300 West Alternative	3400 West Alternative	2800 West Alternative (Preferred Alternative)
<b>Water Quality</b>	Implementation of best management practices would minimize surface water quality impacts. Overall, less impervious surface (400 acres) would be required compared to the build alternatives. No impacts to groundwater quality. 15 groundwater wells affected.	Implementation of best management practices would minimize surface water quality impacts. No impacts to groundwater quality. 14 groundwater wells affected. Direct increase in impervious surface of 779 acres. Indirect increase of 150 acres.	Implementation of best management practices would minimize surface water quality impacts. No impacts to groundwater quality. 19 groundwater wells affected. Direct increase in impervious surface of 846 acres. Indirect increase of 150 acres.	Implementation of best management practices would minimize surface water quality impacts. No impacts to groundwater quality. 8 groundwater wells affected. Direct increase in impervious surface of 1,009 acres. Indirect increase of 150 acres.
<b>Wetlands/Waters of the U.S.</b>	No wetlands affected. Several waters of the U.S. (dry washes) would be crossed.	No wetlands affected. Flows into waters of the U.S. (dry washes) would be controlled to maintain hydraulic capacity.	No wetlands affected. Flows into waters of the U.S. (dry washes) would be controlled to maintain hydraulic capacity.	No wetlands affected. Flows into waters of the U.S. (dry washes) would be controlled to maintain hydraulic capacity.
<b>Water Body Modification and Wildlife</b>	No impacts to water bodies. 400 acres of desert shrub/scrub habitat would be lost to construction. Loss of habitat would result in direct and indirect effects on local wildlife. Potential impacts to golden eagle nest.	No impacts to water bodies. 779 acres of desert shrub/scrub habitat would be lost to construction. Indirect impacts to 150 acres. Loss of habitat would result in direct and indirect effects on local wildlife.	No impacts to water bodies. 846 acres of desert shrub/scrub habitat would be lost to construction. Indirect impacts to 150 acres. Loss of habitat would result in direct and indirect effects on local wildlife.	No impacts to water bodies. 1,009 acres of desert shrub/scrub habitat would be lost to construction. Indirect impacts to 150 acres. Loss of habitat would result in direct and indirect effects on local wildlife. Golden eagle nest next to ROW could be affected by construction.
<b>Floodplains</b>	No significant encroachment on floodplains.	No significant encroachment on floodplains.	No significant encroachment on floodplains.	No significant encroachment on floodplains.
<b>Threatened and Endangered Species</b>	Likely to adversely impact 3 endangered plant species. Construction of a road at 4300 West could affect bald eagle roost. Potential impact to southwestern willow flycatcher with widening of roads over the Virgin River.  This alternative would not provide a barrier to protect the Warner Ridge population of endangered bearclaw poppy from recreation activities.	Likely to adversely impact 3 endangered plant species and the desert tortoise. Project may affect, but is not likely to adversely affect, two fish species. Bald eagle roost next to ROW could be affected during construction.  This alternative would help BLM provide a barrier to protect the Warner Ridge population of endangered bearclaw poppy from recreation activities.	Likely to adversely impact 3 endangered plant species and the desert tortoise. Project may affect, but is not likely to adversely affect, two fish species.  This alternative would help BLM provide a barrier to protect the Warner Ridge population of endangered bearclaw poppy from recreation activities.	Likely to adversely impact 3 endangered plant species and the desert tortoise. Project may affect, but is not likely to adversely affect, two fish species.  This alternative would help BLM provide a barrier to protect the Warner Ridge population of endangered bearclaw poppy from recreation activities.

<b>Resource Category</b>	<b>No-Build Alternative</b>	<b>4300 West Alternative</b>	<b>3400 West Alternative</b>	<b>2800 West Alternative (Preferred Alternative)</b>
<b>Historic, Archaeological, and Paleontological Resources</b>	Potential for impacts on up to 8 National Register of Historic Places (NRHP) archaeological sites and up to 4 paleontological sites.	Impacts on 2 potentially eligible and 20 eligible NRHP archaeological sites and 4 paleontological sites.	Impacts on 21 eligible NRHP archaeological sites and 4 paleontological sites.	Impacts on 2 potentially eligible and 18 eligible NRHP archaeological sites and 4 paleontological sites.
<b>Hazardous Waste Sites</b>	3 hazardous waste sites potentially affected within or adjacent to local road projects.	5 hazardous waste sites within or adjacent to the ROW would be affected.	5 hazardous waste sites within or adjacent to the ROW would be affected.	3 hazardous waste sites within or adjacent to the ROW would be affected.
<b>Visual Resources</b>	Local transportation projects would reduce the visual environment of the project area.	Southern Corridor would reduce the overall visual environment. Visual impact rating of 1.53.	Southern Corridor would reduce the overall visual environment. Visual impact rating of 1.59.	Southern Corridor would reduce the overall visual environment. Visual impact rating of 1.56.
<b>Section 4(f)/6(f) Properties</b>	None	None	None	None

## 2.4.1 No-Build Alternative

### 2.4.1.1 Primary Advantages of the No-Build Alternative

The major advantage of the No-Build Alternative compared to the build alternatives is that there would be no environmental impacts associated with building the Southern Corridor. However, about 400 acres of new local roadway would likely be required. This construction would still result in less overall impervious surface compared to the build alternatives. The No-Build Alternative would cause fewer impacts to wildlife habitat and cultural resources.

### 2.4.1.2 Primary Disadvantages of the No-Build Alternative

The major disadvantage of the No-Build Alternative is that it would not satisfy the project's purpose and need, which is providing a regional transportation facility between St. George, Washington City, and Hurricane. Other disadvantages of the No-Build Alternative are as follows:

- It would not allow the communities in the area to plan, develop, and manage an efficient transportation system for the anticipated growth in the region.
- It could allow continued impacts to the Warner Ridge population of the endangered bearclaw poppy. The build alternatives would provide some protection for this species by limiting access to Warner Ridge.

## 2.4.2 4300 West Alternative

### 2.4.2.1 Primary Advantages of the 4300 West Alternative

- Least amount of ROW required
- Along with the 2800 West Alternative, the fewest relocations required
- Along with the 3400 West Alternative, the fewest acres of grazing allotments affected
- Fewest visual impacts
- The least amount of wildlife habitat impacted

### 2.4.2.2 Primary Disadvantages of the 4300 West Alternative

- Highest number of cultural resources affected
- Second-most acres of farmland affected (1 acre)
- Second-highest construction cost (\$161,460,000)
- Potential impact to bald eagle roost

### **2.4.3 3400 West Alternative**

#### **2.4.3.1 Primary Advantages of the 3400 West Alternative**

- Along with the 4300 West Alternative, the fewest acres of grazing allotments affected
- Lowest construction cost (\$151,640,000)

#### **2.4.3.2 Primary Disadvantages of the 3400 West Alternative**

- Highest number of farmland acres affected (50 acres)
- Highest number of groundwater wells affected
- Second-highest number of cultural resources affected
- Second-highest amount of wildlife habitat affected
- Greatest visual impacts
- Conflicts with proposed Outlaw Ridge development

### **2.4.4 2800 West Alternative (Preferred Alternative)**

#### **2.4.4.1 Primary Advantages of the 2800 West Alternative**

- No farmland impacts
- Fewest cultural resources affected
- Fewest hazardous waste sites along the ROW
- Along with the 4300 West Alternative, the fewest relocations required
- Fewest number of groundwater wells affected

#### **2.4.4.2 Primary Disadvantages of the 2800 West Alternative**

- The most recreational resources affected
- Highest cost (\$209,160,000)
- The most acreage of grazing allotments affected
- Highest amount of wildlife habitat affected
- Greatest amount of ROW required
- Potential impact to golden eagle nest

## 2.5 Selection of the Preferred Alternative

The 2800 West Alternative was selected as the Preferred Alternative after review of public and agency comments received on the Draft EIS. The environmental impacts of the three build alternatives were compared by considering the resource categories analyzed in this EIS. The comparison of alternatives provided in Table 2.5-1 revealed that, for most resources, the impacts are similar between the build alternatives. The analysis shows that the alternatives are distinguished primarily by cost, farmland impacts, wildlife habitat impacts, and community and public desire for a certain alternative.

**Table 2.5-1. Southern Corridor Preferred Alternative Selection**

Resource Category	Impacts by Alternative		
	4300 West	3400 West	2800 West
Cost	\$161,460,000	\$151,640,000	\$209,160,000
Community input – public meetings and comments	For: 10 Against: 6	For: 8 Against: 9	For: 19 Against: 1
City input	—	—	Preferred by Hurricane City
Land use	Similar impacts	Similar impacts	Similar impacts
Farmland	1 acre	50 acres	1 acre
Grazing allotments	257 acres	257 acres	385 acres
Social environment	Similar impacts	Similar Impacts	Similar impacts
Relocations	1	4	1
Economics	Similar impacts	Similar impacts	Similar impacts
Air quality	Similar impacts	Similar impacts	Similar impacts
Noise	Similar impacts	Similar impacts	Similar impacts
Water quality	Similar impacts	Similar impacts	Similar impacts
Wetlands	Similar impacts	Similar impacts	Similar impacts
Wildlife	779 acres of wildlife habitat impacted	846 acres of wildlife habitat impacted	1,009 acres of wildlife habitat impacted; potential indirect impacts to golden eagle nest
Threatened and endangered species	Similar impacts except for indirect impacts to bald eagle roost	Similar impacts	Similar impacts
Cultural resources	22 sites impacted	21 sites impacted	20 sites impacted
Hazardous waste sites	Similar impacts	Similar impacts	Similar impacts
Visual resources	Similar impacts	Similar impacts	Similar impacts

Of the three alternatives, the 3400 West Alternative had the lowest cost but would impact the most farmland, would impact the second-most wildlife habitat, and would bisect the proposed Outlaw Ridge development. The 4300 West Alternative along with the 2800 West Alternative had the fewest impacts to farmland. The 4300 West Alternative would impact the least amount of wildlife habitat because of the shorter roadway length and would have the second-highest cost. The location of this alternative on SR 9 near the Virgin River represents the greatest roadway safety concern of the three alternatives because of the poor sight distance at SR 9.

The 2800 West Alternative is supported by Hurricane City (see comment C-30 in Chapter 11, Comments on the Draft EIS) and had the most support by local residents. The Hurricane City Council and Planning Commission support the 2800 West Alternative for the following reasons:

- Fewer property owners involved
- Improved access to recreation sites and projected future development
- Better opportunities for east-west connection from Hurricane
- Best location for connection to SR 9 because of safer access and proximity to the main part of Hurricane
- Lowest number of cultural sites affected

The environmental impacts of the three build alternatives are similar, with the main difference being the total number of acres of wildlife habitat affected. The 2800 West Alternative would convert the greatest amount of wildlife habitat to roadway use. Because the environmental impacts from the 2800 West Alternative and the other build alternatives are similar for most resources, and because the 2800 West Alternative has the support of the public and the local community, it was selected as the Preferred Alternative.